City of Chicopee
City Council
Public Works Committee

Members
Fred Krampits, Chair
Frank Laflamme, Vice Chair
Shane Brooks
Gary Labrie
Stanley Walczak

APPROVED 7-31-19

MINUTES
June 12, 2019

The following are the minutes of a public hearing held Wednesday, June 12, 2019 at 6:30 PM at the RiverMills Senior Center, 5 West Main Street, Chicopee, MA 01020 in Card Room #9.

Members Present Krampits, Laflamme, Labrie, Walczak

Members Absent Brooks

Also Present Dan Garvey (Associate City Solicitor), Elizabette Botelho (DPW Superintendent), Councilor Balakier, Councilor Zygarowski, Holly Davis (Lt. Police Department), Elizabeth Soja (Assistant to the DPW Superintendent), Daniel Stamborski (Fire Chief), Chris Chaban (Acting City Engineer)

The meeting was called to order at 6:30 PM

In compliance with the Open Meeting Law the Chairman asked if anyone in the audience was recording the meeting. Hearing none the meeting continued.

ITEM #1
BE IT ORDERED THAT the Engineering Department appear before the Public Works Committee to discuss proposed traffic techniques for the Front Street Crosswalk Project.

Chris Chaban stated that this issue came up when there was a request to have a section from Wheatland Avenue and Bell Street designated as a Safety Zone. That means that this area would become a permanent 20 MPH zone 24/7. He continued that at that time the general perception was that it would have low adherence. This proposal is an alternative method to that which is widely used across the country basically used to slow speed. There are two options: (1) speed table – similar to a speed bump but it's over a longer stretch, not as abrupt as a speed bump. It has a 6 foot long ramp raised 3 inches to a 10 foot long plateau then a ramp that comes down. It can be effective at reducing speed to 20 to 30 MPH. With a speed table there is no need for utility work when constructing. (2) Raised crosswalk which is basically a speed table with a crosswalk on top of it. They are built differently. They extend to the curb on each side. With a raised crosswalk utility

work will need to be done. The initial proposal was for 4 raised crosswalks between Wheatland Avenue and Bell Street. Within this area are preschools, a church, entrance to Szot Park, Library, and elderly housing. Since then DPW has determined that due to the amount of utilities involved 2 of those cannot be built as raised crosswalks because of the inability to move the drainage around in the street to accommodate. The proposal now is for at least two of those to be speed tables or potentially just doing 4 speed tables. Engineering has conducted some information gathering for this proposal. One thing done is a traffic study to determine if there is a speeding problem. October and November of 2018 traffic tubes were set up and it was determined that the 85th percentile speed is 37.5 MPH. The design speed when Front Street was reconstructed is 37.5 MPH. The current speed is 30 MPH – the ordinance is 25MPH but the postings are 30 MPH. The question is the whether the speed tables will fix the problem. The Safety Zone (20 MPH) is not going to work for this area. So this calming technique is to slow down speed in the area without officially designating it as 20 MPH Safety Zone. The speed limit would still be posted as it is on the street. But this has the potentially of reducing the speed from 20 – 30 MPH.

Lt. Davis stated that the Police Department has no pedestrian accident reports in this area that were related to speed. She continued that she would like to comprehend why it would be optimum for Law Enforcement to go with this proposal if it's not a problem area while other parts of the City are problem areas.

Elizabette Botelho stated that it came through as a Councilor request by then Councilor Zaskey. The Safety Zone was spearheaded by Councilor Tillotson. She continued that in her opinion the Safety Zone would not be very effective. The School Department and the Mayor's Office wanted the DPW to consider created a raised crosswalk to help improve safety for kids crossing the street. Elizabette stated that you see these crosswalks in Westfield, Northampton, South Hadley and Amherst. She stated that Front Street is a nice flat road with many sensitive users; students, elderly and businesses. It seemed that Front Street was a good place for the DPW to try this out.

Councilor Laflamme asked what the cost difference is between the speed table versus raised crosswalks. Chris Chaban replied that the cost of 4 raised crosswalks is $100,000. This includes utility relocation, sidewalk work, ramps, and curb resetting. The speed table cost is $70,000. Councilor Laflamme stated that the City could be opening up Pandora's Box because residents will want it done in other areas of the city. He suggested doing one speed table and see how it works. Councilor Laflamme stated that in South Hadley by Mount Holyoke College the flashing lights indicating a crosswalk make him slow down. Councilor Laflamme stated that the Police Department has no issues with Front Street but in Aldenville 2 people have died. He suggested trying one on Front Street and then adding on in the future.

Elizabette stated that the Grattan Street problem that Councilor Laflamme is referring to will be addressed by a Mayor's Order for rapid beacons flashing. When a pedestrian presses the button to cross the street it will trigger lights to flash on the signs. The cost is $8,300.00. Liz continued that if the City only installs one speed table on Front Street the benefits will not be shown. She stated that you have to have the 4 to see a reduction in speed.

Councilor Balakier stated that when historically Front Street was designed we didn't have 3 schools. He stated that we have been very lucky on Front Street that there haven't been more injuries. He further stated that he believes the City is receiving Chapter 90 money to pay for the Front Street project not costing the city any money. This could be a test area for the City for other parts of the City. He feels that this is the right time of year to do this because schools will not be in session.

Councilor Labrie stated that he agrees that the City needs to slow traffic down but he would like to know if the Fire and Police Departments have concerns about response times because of the raised crosswalks or speed tables and will these cause any effect on the City's equipment.

Chief Stamborski stated that all the Fire Department's equipment is very heavy so they can't accelerate fast. So, yes, it would slow down the Fire Department. He further stated that his personal experience with Front Street is that of a parking lot. He does not see speeding vehicles because drivers cannot move. He also stated that traffic alone slows the Fire Department down when responding to a call.

Lt. Davis stated that the Police Chief is not in support of the speed tables. He feels that it will slow down the Police Officers responding to calls. She also stated that Front Street during the day is at times gridlock. So, speed is really not the factor when it comes to the daytime. Making the speed 20 MPH 24/7 would not be effective. If the traffic study shows that the speed is 37.5 MPH it would be counterproductive to slow down the traffic because speed is based on how traffic is flowing. This coupled with the fact that there haven't been crash reports to facilitate and documentation of any real problem in this specific area are some of the reasons why the Chief was not supportive of this request.

Elizabette asked if the Police and Fire Department would be willing to reach out to other communities that have these speed tables in place and see what their experience is with them as far as response times. Lt. Davis stated that it would be beneficial to get more information.

Chris Chaban stated that if the City was to proceed it will only be effective if all 3 are installed consecutively. The proposal is for speed tables to be 1100 feet apart. Some communities have them 300 feet apart. If this proposal is approved it will have to go to MassDOT for approval.

Councilor Walczak asked if there is a conflict of the speed limit on Front Street. Chris Chaban replied that the ordinance states the speed is 25 MPH but the signage is 30 MPH. Councilor Walczak asked Lt. Davis if the signs do not match the ordinance how do drivers get ticketed. Lt. Davis stated that it goes by the posted sign. Elizabette Botelho stated that there is a traffic control agreement in place for Front Street and that agreement states that the speed limit is 30 MPH. Councilor Walczak stated that another area that should be considered on Front Street is in front of City Hall because of the speeding cars. Trying to cross the street at the crosswalk is dangerous. Elizabette Botelho stated that DPW is purchasing 2 pedestrian crossing lights. The proposal is for one light in front of City Hall and one in front of Lucky Strike. Councilor Walczak asked about issued citations for speeding on Front Street. Lt. Davis stated that she can get that information.

Councilor Laflamme stated that the proposal is costing $80,000 or $90,000 covering only a small area. He further stated that he is not in opposition of the proposal but it's a lot of money. He continued that he feels that Grattan Street is a more dire necessity at this time. Elizabette Botelho stated that when installing the speed tables they have to take into consideration the grade of the street. She also stated that you would not install them at an intersection.

Councilor Balakier stated that the proposed project will not cost the City any money.

Councilor Walczak stated that he has observed drivers coming up the hill on Grattan Street toward the off ramp of 391speeding at 40 or 50 MPH. He suggested Police Officers be placed in this area to issue speeding citations.

Chris Chaban stated that if the speed going up the hill on Grattan Street is 45 MPH speed tables will not be appropriate because if a car hit the ramp on the speed table at that speed it could cause an accident.

Councilor Labrie stated that once drivers arrive at the top of the hill of Grattan Street they do slow down. So, 1,000 feet from where the speed table would be they are not driving at a speed of 45 MPH.

Councilor Walczak asked if the Police Department works with the crossing guards and trains them. Lt. Davis stated that the School Department trains all crossing guards. She continued that if the crossing guard is out sick for the day and the area that they monitor is heavily congested then the Police Department will fill in for the crossing guard.

Councilor Balakier stated that it's important to be having this discussion and for the City to be proactive. He would like to see this proceed instead of postponing. He suggested for Front Street to be a model for than other areas of the City.

Elizabette Botelho stated that the project will need to go out to bid. Right now DPW has set aside in their budget $100,000 for raised sidewalks. Councilor Laflamme stated that he has $100,000 for road work. He would like to use his $100,000 for the Grattan Street project.

Chris Chaban stated that speed tables would work best. The cost would be about $35,000. Councilor Laflamme stated that he is favor of speed tables on Front Street but he would like to see Grattan Street addressed also.

Motion made by Councilor Laflamme and second by Councilor Labrie to postpone to the call of the chair.

1. Costing between raised crosswalks and speed tables
2. Also costing for Grattan Street as well
3. Feedback from Police and Fire from surrounding cities that have them

Committee vote 4 – 0 favorable.

ITEM #2

Minutes – November 1, 2018. Motion made by Councilor Laflamme and second by Councilor Krampits to approve. Motion passed.

Meeting adjourned at 7:21 PM.

3.12 Speed Table

DESCRIPTION AND GENERAL PURPOSE

A speed table is a raised area placed across the roadway designed to physically limit the speed at which a vehicle can traverse it. Like a speed hump, it extends across the travelway. Unlike a speed hump, a speed table has a long enough flat top (typically, 10 feet) to accommodate the entire wheelbase of most passenger cars. The longer longitudinal depth in the direction of travel enables comfortable and safe vehicle operating speeds that are faster than for a speed hump. Figure 3.12.1 illustrates a typical application.

When a speed table is designated as a crosswalk through the use of striping, it is known as a raised crosswalk (see section 3.14).

[Three field studies of 27 speed tables measured crash reductions between 36 and 64 percent (Source: FHWA, Engineering Speed Management Countermeasures: A Desktop Reference of Potential Effectiveness in Reducing Crashes, July 2014) http://www.safety.fhwa.dot.gov/speedmgt/ref_mats/eng_count/2014/reducing_crashes.cfm]

[Six field studies of 98 speed tables measured reductions between 4 and 11 mph for 85th percentile speeds (Source: FHWA, Engineering Speed Management Countermeasures: A Desktop Reference of Potential Effectiveness in Reducing Speed, July 2014) http://www.safety.fhwa.dot.gov/speedmgt/ref_mats/eng_count/2014/reducing_speed.cfm]

Figure 3.12.1. Typical Speed Table Application

(Source: www.pedbikeimages.org / Austin Brown)

APPROPRIATE APPLICATION

Appropriate Application – Speed Table	
Type of Street	Can be installed on a local street, collector street, and in certain circumstances, an arterial street
Intersection or Roadway Segment	Placed at a midblock location; Pennsylvania recommends a distance of 150 feet from an unsignalized intersection and 250 from a signalized intersection If placed at an intersection, called a raised crosswalk or raised intersection Should not be placed on a sharp curve; ITE *Guidelines for the Design and Application of Speed Humps* recommends a minimum horizontal curve radius of 300 feet
Roadway Cross-Section	Can be used on a single-lane one-way or two-lane two-way street (see Figure 3.12.2) Typically installed with an urban cross-section (i.e., curb and gutter)[13] but an open section can be acceptable Can be applied both with and without sidewalks or bicycle facilities
Speed Limit	ITE *Guidelines for the Design and Application of Speed Humps* recommends consideration only on a street with a posted speed limit of 30 mph or less; many jurisdictions follow the same maximum (e.g., South Carolina, Pennsylvania); others have chosen a 35 mph maximum (e.g., Delaware, Pasadena) Generally not appropriate when the pre-implementation 85th percentile speed is 45 mph or more
Vehicle Traffic Volume	Some jurisdictions provide guidance on a maximum traffic volume that can be properly accommodated; Pennsylvania sets a maximum daily volume of 3,500; South Carolina uses a maximum of 4,000; Pasadena, CA uses a maximum of 4,000, with at least 1,000 vehicles in each direction *ITE Guidelines for the Design and Application of Speed Humps* recommends consideration if no more than five percent of the overall traffic flow consists of long-wheelbase vehicles
Emergency Route	Generally not appropriate for a primary emergency vehicle route or street that provides access to a hospital or emergency medical services; another form of vertical deflection – a speed cushion - could be appropriate
Transit Route	Generally not appropriate for a bus transit route with BRT, Express, or Limited Stop service (unless the posted speed limit is 30 mph or less); speed cushion could be appropriate Can be appropriate along a neighborhood circulator or other local bus service route Should not be located near bus stop to insure passengers are not transitioning between standing and sitting as the bus crosses over the speed table
Access Route	Not appropriate along the primary access to a commercial or industrial site
Grade	Can be installed on, or beyond, a crest vertical curve only if there is adequate stopping sight distance or warning signs are provided

	ITE *Guidelines for the Design and Application of Speed Humps* recommends consideration only with a grade of 8 percent or less; many jurisdictions adhere to that maximum grade (e.g. Pennsylvania, South Carolina) but others follow a lower maximum: Delaware – 6 percent; Minnesota – 5 percent

[13] If the street does not have curbing, an obstruction such as signing, flexible delineator posts, or bollards may be acceptable to prevent a motorist from driving around the table. Potentially hazardous objects (e.g., rocks, boulders) should not be used.

Figure 3.12.2. Speed Table with Choker
(Source: Google Street View)

EFFECTS AND ISSUES

Effects and Issues – Speed Table	
Vehicle Speed	Single speed table reduces 85th percentile speeds to the range of 25 to 35 mph when crossing the table; speed reduction effects decline at the rate of approximately 0.5 to 1 mph every 100 feet beyond the 200 foot approach and exit of a speed table; in order to retain slower vehicle speeds over a longer distance, a series of speed tables is needed (as shown in Figure 3.12.3) ITE *Guidelines for the Design and Application of Speed Humps* recommends a spacing of between 260 and 500 feet; some jurisdictions have refined these guidelines: • Pennsylvania – spacing between 250 and 600 feet • South Carolina – spacing of no less than 350 feet

	• Virginia – spacing of approximately 500 feet, with clear visibility of 200 feet, and placement no closer than 200 feet from an intersection • Pasadena – only on a street segment that is at least 1,200 feet in length and on which any traffic signals or Stop signs are at least 1,200 feet apart Proper placement of the initial speed table in a series is significant; ITE *Guidelines for the Design and Application of Speed Humps* recommends "the first speed [table] in a series is normally located in a position where it cannot be approached at high speed from either direction; to achieve this objective, it is typically installed within 200 feet or less of a small-radius curve or Stop sign or, if installed on a street with a significant downgrade, at the top of a hill" Refer to Module 4 for additional data
Vehicle Volume	As single installation, there is little traffic diversion from the street; as part of a series, typical volume reductions of 20 percent observed Refer to Module 4 for additional data
Pedestrian Safety and Mobility	Appropriate location for a crosswalk; in traffic calming terms, a crosswalk on a speed table is called a raised crosswalk [provide link to section 3.14] Refer to Module 6 for additional discussion
Bicyclist Safety and Mobility	Bicyclist safety should not be affected; some jurisdictions use a maximum street grade of 5 percent if the street is designated as a bicycle route Bicyclist can negotiate a speed table with little delay or discomfort; it is also possible to bypass speed table by passing through the gap between the table and the curb and gutter
Motorist Safety and Mobility	Produces sufficient discomfort to a motorist driving above the speed table design speed to discourage speeding Can be constructed with brick or other textured materials on the flat section
Emergency Vehicle Safety and Mobility	Less speed delay than for a speed hump Has less jarring effect on long, stiff-bodied emergency service vehicle than speed hump Refer to Module 5 for additional discussion
Large Vehicle Safety and Mobility	Larger vehicle typically crosses at slower speed than does a personal passenger motor vehicle Refer to Module 5 for additional discussion
Accessibility of Adjacent Property	May result in the removal of on-street parking adjacent to speed table, on both sides of the street Should be placed at least five feet from a driveway for comfort
Environment	Potential for increased noise due to vehicle braking and accelerating and to the vibration of loose items in truck beds or trailers
Design Issues	Placement factors include vertical and horizontal alignment of street, proximity to nearest intersection, location of driveways and on-street parking, presence or absence of street lighting, location of designated pedestrian crossings, drainage, and utility access points (drains, valves, etc.)

	Should not be located as to require the relocation of above-ground and below-ground utilities A speed table does not extend from curb to curb Typically, does not interfere with drainage because table does not extend from curb to curb; however, if drainage gutter or flow of water is in the center of the roadway, drainage and hydraulic impacts need to be evaluated

Figure 3.12.3. Speed Table in a Series
(Source: James R. Barrera)

ADDITIONAL DESIGN CONSIDERATIONS

Most agencies implement speed tables with a height of between 3 and 3.5 inches and an overall travel length of 22 feet. The most common speed table consists of a 10 foot plateau with 6 foot approaches on both sides that can be straight, parabolic or sinusoidal in profile. Speed tables with heights as great as 6 inches, ramps of up to 10 feet, and plateaus between 18 and 23 feet in length have been tested and found to better accommodate large vehicles with long wheelbases (such as fire trucks and transit buses).

A speed table should be clearly marked, so all roadway users are able to anticipate it and reduce their speeds appropriately.

Accessibility of Adjacent Property	May result in the removal of on-street parking adjacent to offset speed table, on both sides of the street Should be placed at least five feet from a driveway for comfort
Environment	Potential for increased noise due to vehicle braking and accelerating and to the vibration of loose items in truck beds or trailers
Design Issues	Placement factors include vertical and horizontal alignment of street, proximity to nearest intersection, location of driveways and on-street parking, presence or absence of street lighting, location of designated pedestrian crossings, drainage, and utility access points (drains, valves, etc.) Driver circumnavigation can be minimized with small median islands leading up to each table, with double-centerline and raised pavement markers Should not be located as to require the relocation of above-ground and below-ground utilities Typically, does not interfere with drainage; but roadway, drainage and hydraulic impacts should be evaluated

ADDITIONAL DESIGN CONSIDERATIONS

The spacing between offset speed tables is typically a minimum of 50 feet (measured between the closest taper edges).

Typical height of offset speed tables is between 3 and 3.5 inches, with an overall travel length of 22 feet. The most common speed table consists of a 10 foot plateau with 6 foot approaches on both sides that can be straight, parabolic or sinusoidal in profile. Speed tables with heights as great as 6 inches, ramps of up to 10 feet, and plateaus between 18 and 23 feet in length have been tested and found to better accommodate large vehicles with long wheelbases (such as fire trucks and transit buses).

An offset speed table should be clearly marked, so all roadway users are able to anticipate it and reduce their speeds appropriately.

3.14 Raised Crosswalk

DESCRIPTION AND GENERAL PURPOSE

A raised crosswalk is a variation of a flat-topped speed table. A raised crosswalk is marked and signed as a pedestrian crossing. The 10-foot flat top on a typical speed table conforms to a desired crosswalk width (see Figure 3.14.1).

There are two distinct raised crosswalk designs. Both use a modified version of the common 22-foot speed table:

- The most common type is constructed flush against the roadside curb.
- The other type is constructed on an open section (requiring a curb ramp on the raised crosswalk) or separate from the curb (requiring a curb ramp on both the curb and the raised crosswalk).

A raised crosswalk improves pedestrian safety by causing motorist speed to decrease at the crossing (see Figure 3.14.2).

A raised crosswalk is typically between 3 and 6 inches above street level. It is common for a raised crosswalk to be level with the street curb. This height increases the visibility of a pedestrian in a crosswalk to a motorist. It

also improves the line of sight for a pedestrian toward an oncoming vehicle.

A raised crosswalk can be placed midblock or at an intersection.

A stop-animation film that demonstrates the benefits of a raised crosswalk can be accessed at the following hyperlink: http://www.streetfilms.org/raised-crosswalk/ (Source: Streetfilms)

A video of pedestrians, bicyclists, and motor vehicles passing over a raised crosswalk can be accessed at the following hyperlink:

http://www.yargerengineering.com/articles/traffic calming.html#Raised crosswalk (Source: Yarger Engineering, Inc.)

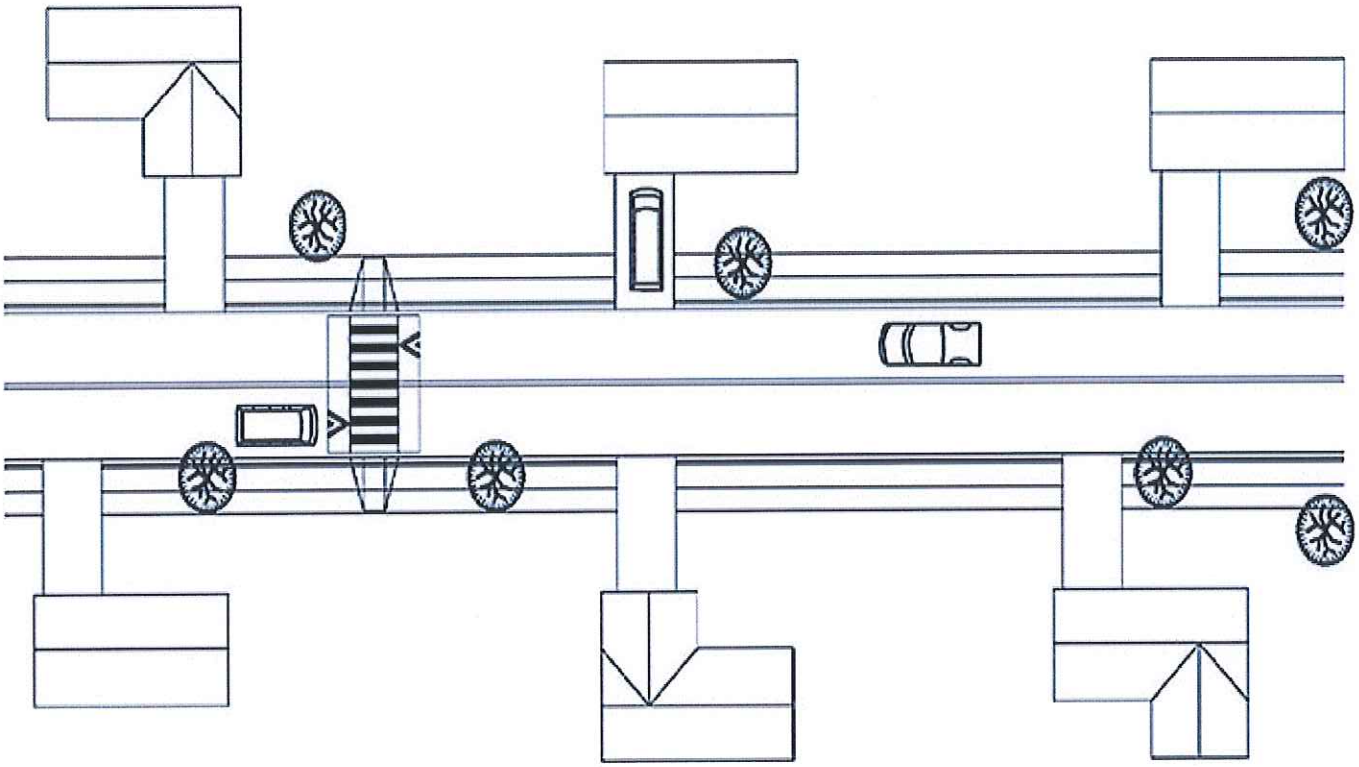


Figure 3.14.1. Raised Crosswalk Schematic
(Source: Delaware Department of Transportation)

Figure 3.14.2. Typical Raised Crosswalk Application
(Source: Jeff Gulden)

APPROPRIATE APPLICATION

Appropriate Application – Raised Crosswalk	
Type of Street	Appropriate if there is an existing crosswalk in the approximate crossing location or if a crosswalk is warranted based on local standards and criteria Generally installed on a residential local street or a collector street (or on a low-speed arterial street through a commercial district)
Intersection or Roadway Segment	Can be placed at a midblock location (see Figure 3.14.3) or at an intersection (see Figure 3.14.4) Should not be placed on a sharp curve; ITE *Guidelines for the Design and Application of Speed Humps* recommends a minimum horizontal curve radius of 300 feet
Roadway Cross-Section	Can be used on a single-lane one-way or two-lane two-way street Typically installed with an urban cross-section (i.e., curb and gutter)[15] but an open section can be acceptable Cross-section can include on-street parking

	Can be applied both with and without sidewalks or bicycle facilities
Speed Limit	ITE *Guidelines for the Design and Application of Speed Humps* recommends consideration only on a street with a posted speed limit of 30 mph or less; many jurisdictions follow the same maximum (e.g., South Carolina, Pennsylvania); others have chosen a 35 mph maximum (e.g., Delaware, Pasadena) Generally not appropriate when the pre-implementation 85th percentile speed is 45 mph or more
Vehicle Traffic Volume	A maximum traffic volume could be appropriate if the raised crosswalk functions more as a speed table; however, many raised crosswalks are installed at locations with high pedestrian volume, high vehicle volume, and low vehicle speed (for example, in a downtown)
Emergency Route	Generally not appropriate for a primary emergency vehicle route or street that provides access to a hospital or emergency medical services
Transit Route	Can be appropriate for a bus transit route if typical bus operating speeds are in 25 mph range Should not be located near bus stop to insure passengers are not transitioning between standing and sitting as the bus crosses over raised crosswalk
Access Route	Not appropriate along the primary access to a commercial or industrial site
Grade	Can be installed on a crest vertical curve only if there is adequate stopping sight distance or appropriate warning signs provided ITE *Guidelines for the Design and Application of Speed Humps* recommends consideration only with a grade of 8 percent or less; many jurisdictions adhere to that maximum grade (e.g. Pennsylvania, South Carolina; Portland OR) but others follow a lower maximum: Delaware – 6 percent; Minnesota – 5 percent

[15] If the street does not have curbing, an obstruction such as signing, flexible delineator posts, or bollards may be acceptable to prevent a motorist from driving around the table. Potentially hazardous objects (e.g., rocks, boulders) should not be used.

Figure 3.14.3. Raised Crosswalk Midblock
(Source: R. Goldberg)

Figure 3.14.4. Raised Crosswalk at Intersection
(Source: City of Cambridge, Massachusetts)

EFFECTS AND ISSUES

Effects and Issues – Raised Crosswalk	
Vehicle Speed	Single raised crosswalk reduces 85th percentile speeds to the range of 20 to 30 mph when crossing the crosswalk; speed reduction effects decline at the rate of approximately 0.5 to 1 mph every 100 feet beyond the 200 foot approach and exit of a raised crosswalk; in order to retain slower vehicle speeds over a longer distance, a series of speed tables or raised crosswalks is needed ITE *Guidelines for the Design and Application of Speed Humps* recommends a spacing of between 260 and 500 feet; some jurisdictions have refined these guidelines: • Pennsylvania – spacing between 250 and 600 feet • South Carolina – spacing of no less than 350 feet • Virginia – spacing of approximately 500 feet, with clear visibility of 200 feet, and placement no closer than 200 feet from an intersection • Pasadena – only on a street segment that is at least 1,200 feet in length and on which any traffic signals or Stop signs are at least 1,200 feet apart Proper placement of the initial raised crosswalk in a series is significant; ITE *Guidelines for the Design and Application of Speed Humps* recommends "the first [raised crosswalk] in a

	series is normally located in a position where it cannot be approached at high speed from either direction; to achieve this objective, it is typically installed within 200 feet or less of a small-radius curve or Stop sign or, if installed on a street with a significant downgrade, at the top of a hill" Refer to Module 4 for additional data
Vehicle Volume	As single installation, there is little traffic diversion from the street; as part of a series, typical volume reductions of 20 percent observed Refer to Module 4 for additional data
Pedestrian Safety and Mobility	Pedestrian safety improved because (1) vehicle speed is lowered at crosswalk, (2) pedestrian in a raised crosswalk is more visible to an oncoming motorist and (3) pedestrian has an elevated view of oncoming traffic; raised crosswalk could be combined with a curb extension to provide additional visibility for pedestrian (see Figure 3.14.5) If raised crosswalk is the same height as the curb, edge of the raised crosswalk should be differentiated with a detectable warning or truncated domes to warn a person with a visual impairment Refer to Module 6 for additional discussion
Bicyclist Safety and Mobility	Bicyclist safety should not be affected; some jurisdictions use a maximum street grade of 5 percent if the street is designated as a bicycle route Bicyclist can negotiate a raised crosswalk with little delay or discomfort (see Figure 3.14.6)
Motorist Safety and Mobility	Produces sufficient discomfort to a motorist driving above the raised crosswalk design speed to discourage speeding
Emergency Vehicle Safety and Mobility	Less speed delay than for a speed hump Has less jarring effect on long, stiff- bodied emergency service vehicle Refer to Module 5 for additional discussion
Large Vehicle Safety and Mobility	Larger vehicle typically crosses at slower speed than does a personal passenger motor vehicle Refer to Module 5 for additional discussion
Accessibility of Adjacent Property	May result in the removal of on-street parking adjacent to raised crosswalk, on both sides of the street Typically placed at least five feet from a driveway but can be designed to incorporate a driveway
Environment	Potential for increased noise due to vehicle braking and accelerating and to the vibration of loose items in truck beds or trailers
Design Issues	Placement factors include vertical and horizontal alignment of street, proximity to nearest intersection, location of driveways and on-street parking, presence or absence of street lighting, location of designated pedestrian crossings, drainage, and utility access points (drains, valves, etc.) Extends from curb to curb and therefore affects surface drainage on the roadway; likely that a

	catch basin will be required on the upstream side of the raised crosswalk; drainage and hydraulic impacts need to be evaluated Should not be located as to require the relocation of above-ground and below-ground utilities

Figure 3.14.5. Raised Crosswalk with Curb Extension
(Source: Scott Batson)

Figure 3.14.6. Raised Crosswalk with Bicycle Lane
(Source: Scott Batson)

ADDITIONAL DESIGN CONSIDERATIONS

The primary difference between a speed table design and a raised crosswalk design is the height and manner in which it meets the curb.

Most agencies implement raised crosswalks with a height of between 3 and 3.5 inches and an overall travel length of 22 feet. The most common raised crosswalk consists of a 10 foot plateau with 6 foot approaches on either side that can be straight, parabolic, or sinusoidal in profile.

A raised crosswalk requires incorporation of all the standard crosswalk design elements. The markings must be visible to motorists, especially at night.

For a raised crosswalk, the longitudinal drainage taper can be removed to form a level pedestrian crossing. Drainage will still need to be provided, such as by using a trench drain through the raised crosswalk and covered with an ADA-compliant grate (see Figure 3.14.7). Another option is to place the drainage inlet upstream of the raised crosswalk.

A raised crosswalk should be clearly marked, so all roadway users are able to anticipate it and reduce their speeds appropriately.

So that a person with visual impairment can differentiate the roadway from the sidewalk at a raised crosswalk, color contrasts and detectable warnings or truncated domes at edges can enable a pedestrian with a vision impairment to detect the crossing.

A sample design for a raised crosswalk is presented in Figure 3.14.8.

Figure 3.14.7. Raised Crosswalk Design to Accommodate Drainage
(Source: Jeff Gulden)

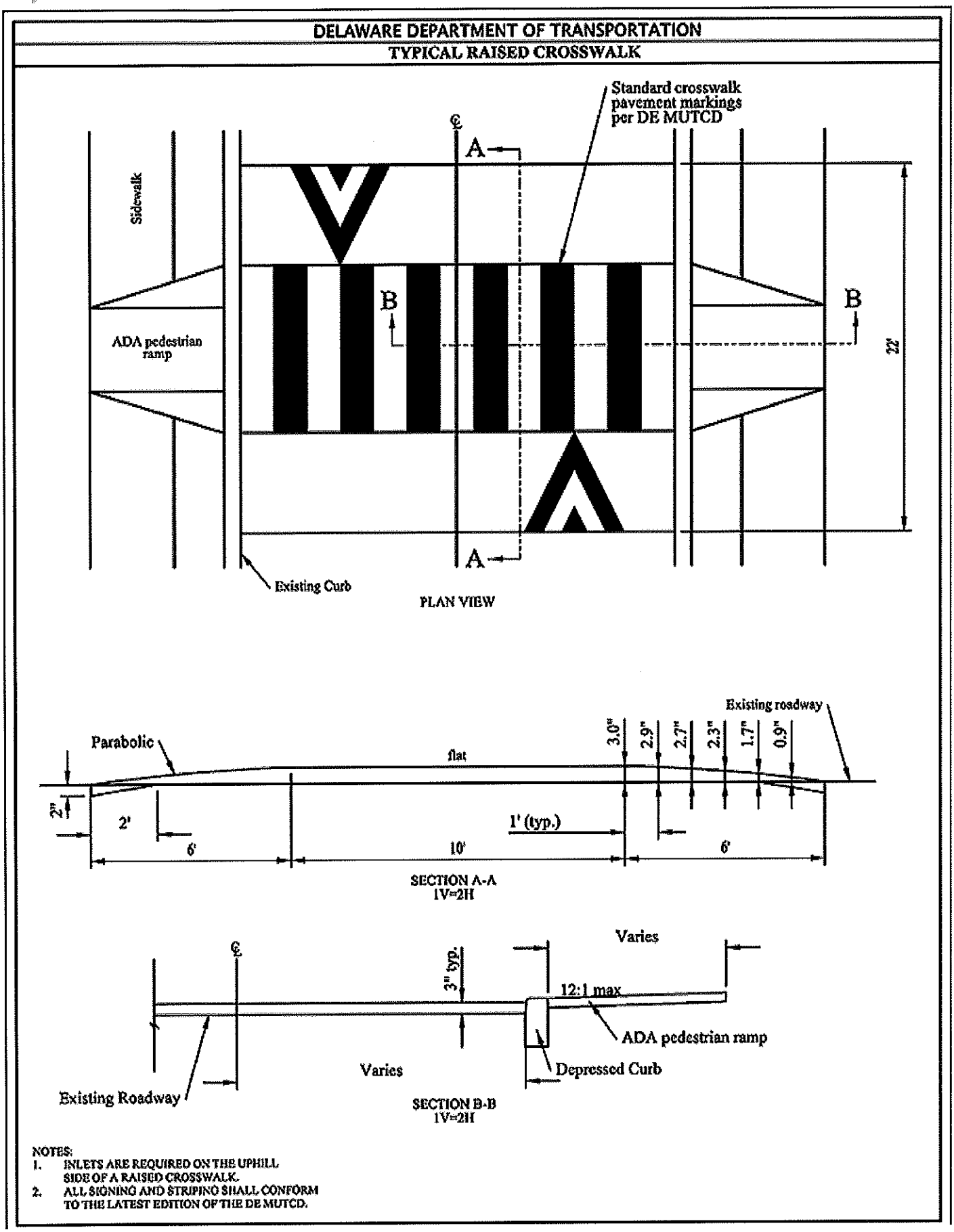


Figure 3.14.8. Sample Design for Raised Crosswalk
(Source: Delaware Department of Transportation)

3.15 Raised Intersection

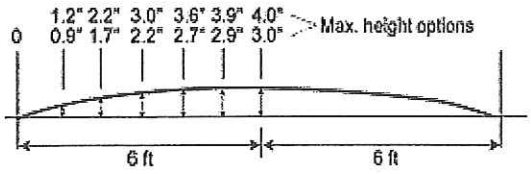
Speed humps may generate noise from vehicles braking and accelerating. Noise impacts on nearby residents can be mitigated through careful locating of the speed humps, or by spacing humps closely to encourage constant speeds.

16.7.1.1 Round-Top Speed Humps

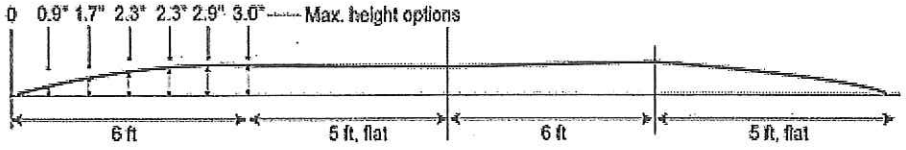
Round-top speed humps are 12-14 feet in length, and rise to a height of 3-4 inches. A common profile, the parabolic crown, illustrated in Exhibit 16-17, permits comfortable crossing at design speed, but makes crossings increasingly uncomfortable as design speed is exceeded.

Exhibit 16-17
Speed Humps and Speed Tables

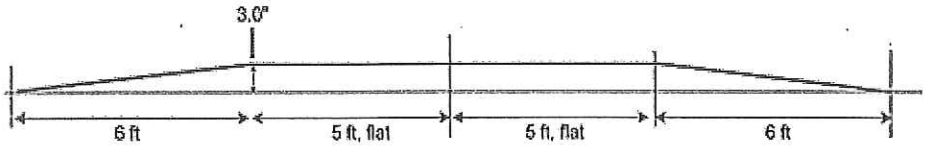
A. 12-Foot Parabolic Crown Hump



B. 22 Foot Parabolic Ramp Speed Table



C. 22 Foot Straight Ramp Speed Table



Round-top humps may be constructed from a wide variety of materials: asphalt, textured or colored asphalt, and poured and stamped concrete. Typically, the space between the end of the hump and the curb is left open, allowing the gutter drainage to continue functioning unhampered.